ANNUAL REPORT FOR 2002

Roanoke Island Mitigation Site

Dare County

Project No. 8.1052501

TIP No. K-4003

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North Carolina Department of Transportation
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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Roanoke Island Mitigation Site. The site was constructed to serve as mitigation for the Roanoke Island Visitor Center/ Rest Area; approximately 1.77 ac of impacts are mitigated for onsite, with another 1.36 ac of preservation debited from the Mashoes Road Mitigation Site serving as the remaining mitigation. The Roanoke Island Site was constructed in 2002, and this report details the first year of monitoring activities following construction.

Initial results for both hydrologic and vegetation monitoring indicates that most of the site is meeting success, as defined in the approved mitigation plan. The hydrologic data shows that both parts of the site meet jurisdictional success, and 4 of the total 6 gauges located in constructed areas are within 20% of the saturation percentages of their counterparts in reference wetlands. Vegetation monitoring yielded an average success rate of 404 stems per acre, well above the 320 stems per acre requirement for the first three years of monitoring.

Based on the results from the first year, NCDOT recommends that monitoring at the Roanoke Island Mitigation Site continue.

1.0 INTRODUCTION

1.1 Project Description

The Roanoke Island Site serves as onsite mitigation for the Roanoke Island Visitor Center/Rest Area, located adjacent to the new US 64-264 Manteo Bypass. The site is divided into two tracts; the "south" tract is on the same property as the proposed Visitor Center while the "north" tract is located approximately 600 feet north of the Visitor Center (Figure 1). The mitigation is associated with project 8.1052501, TIP Nos. K-4003 and R-2551.

The site is designed to provide 0.11 ac of restoration (1:1) and 1.66 ac of creation (1:1) of wetland community classified as Estuarine Fringe. The site also includes 1.29 ac (5:1) of estuarine preservation. In addition, approximately 1003.9 feet of riparian buffer was to be planted with the same vegetation mix as that used in the wetland zones. The width of the buffer zones varies between 9 and 65 feet based on NCDOT property limits. The construction plan for the wetland sites involved grading the former borrow pit areas to meet the elevations of adjacent jurisdictional wetlands.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are fulfilled. Success criteria are based on federal guidelines for wetland mitigation and are stipulated in the "Roanoke Island Visitor Center/ Rest Area Mitigation Plan" dated May 2001 (revised July 2001). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2002 at the Roanoke Island Mitigation Site.

Activities in 2002 reflect the first year of monitoring at the mitigation site. Included in this report are analyses of both hydrologic and vegetative monitoring results as well as local climate conditions throughout the growing season.

1.3 Project History

March 2002	Construction Completed
March 2002	Monitoring Gauges Installed
March 2002	Site Planted
March- November 2002	Hydrologic Monitoring (Year 1)
June 2002	Vegetation Monitoring (Year 1)

1.4 Debit Ledger

The Roanoke Island Mitigation Site serves entirely as mitigation for the Roanoke Island Visitor Center/ Rest Area. Approximately 1.36 ac of additional preservation area will be debited from the Mashoes Road Mitigation Site to account for all of the wetland impacts caused by construction.

Figure 1. Location Map- Roanoke Island Mitigation Site

2.0 HYDROLOGY

2.1 Success Criteria

While a constructed site must typically meet jurisdictional criteria of inundation or saturation within 12 inches of the surface for at least 12.5% of the growing season, NCDOT and consulting agencies agreed that other criteria may be the best indicator of hydrologic success on this particular site. In accordance with the guidelines set forth by the approved mitigation plans, hydrologic success is dictated by the hydrologic condition of the reference wetlands adjacent to the sites. Monitoring gauges are located in both the constructed and reference areas. The site is considered a hydrologic success if the hydrologic frequency, duration and depth are within 20% of its respective reference wetland.

The growing season in Dare County begins March 13 and ends November 25. The dates correspond to a 50% probability that temperatures will drop to 28^{o} F or lower after March 13 and before November 25.[1] While the monitoring gauges record ground/surface water levels throughout the year, special attention is placed on water levels during the 258-day growing season. In addition, local rainfall totals are monitored to ensure that the site is functioning in normal climatic conditions.

2.2 Hydrologic Description

The site was constructed by grading existing fill material down to meet the elevations of existing reference wetlands. The removed fill material is associated with borrow pit/ spoil basins that were previously onsite. Eleven monitoring gauges were located on the sites in order to monitor the new hydrologic conditions. Three gauges were located on the north tract, while eight gauges were located on the south tract. Of these, one gauge is located within the north tract reference wetland, while four gauges are located within reference areas in the south tract. The success of the site is determined by comparing the groundwater levels in the reference areas with those in the constructed zones.

Site rainfall is monitored with a rainfall gauge located onsite. In addition, the recorded data is compared to rainfall data at the Manteo Airport gauge in order to check the accuracy of the measured data. The Manteo data was provided by the NC State Climate Office. Figures 2 and 3 are monitoring gauge maps of the north and south tracts, respectively.

[1] Natural Resources Conservation Service, Soil Survey of Dare County, North Carolina, p.69.

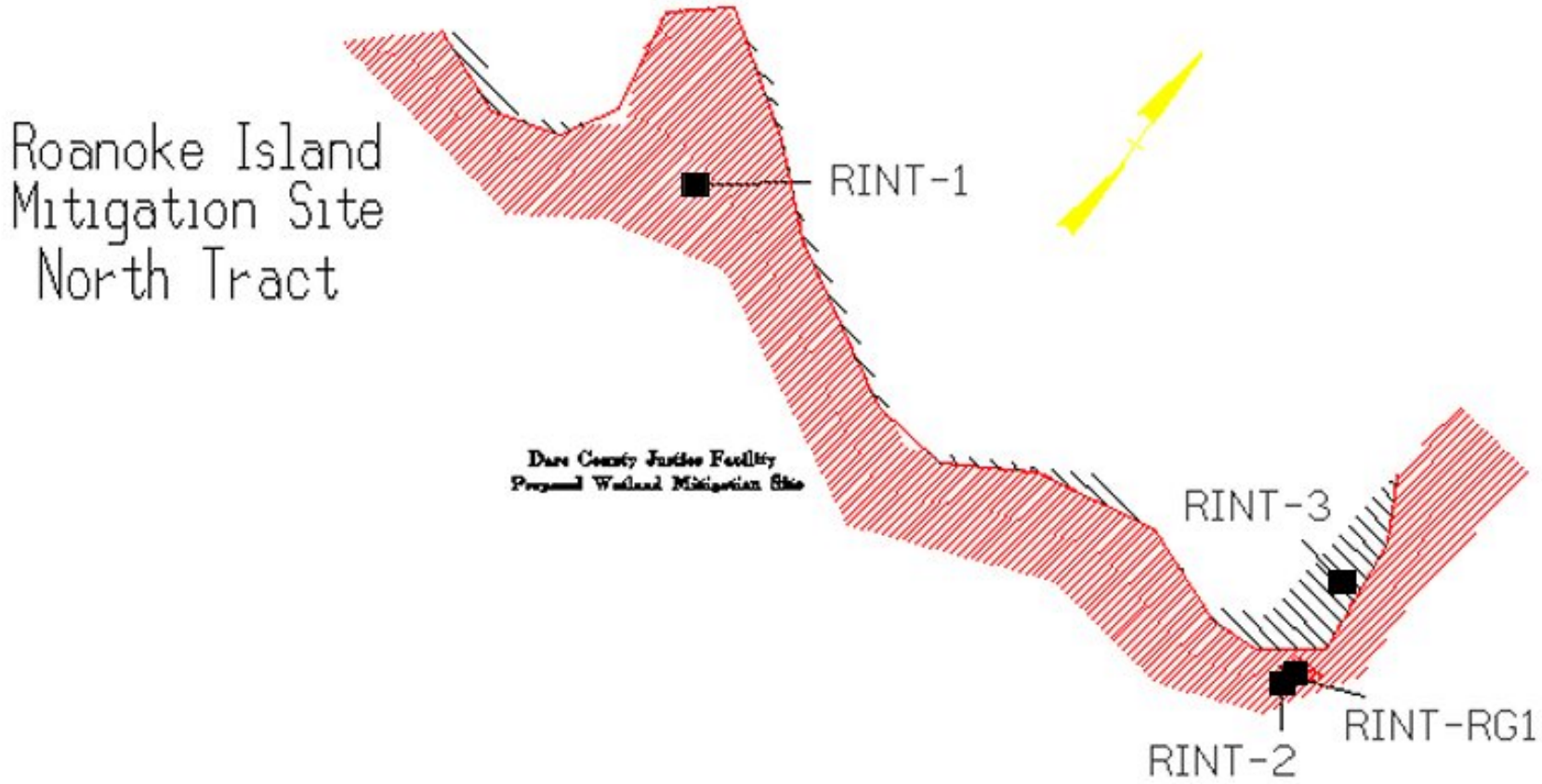

Figure 2. Monitoring Gauge Location Map- North Tract

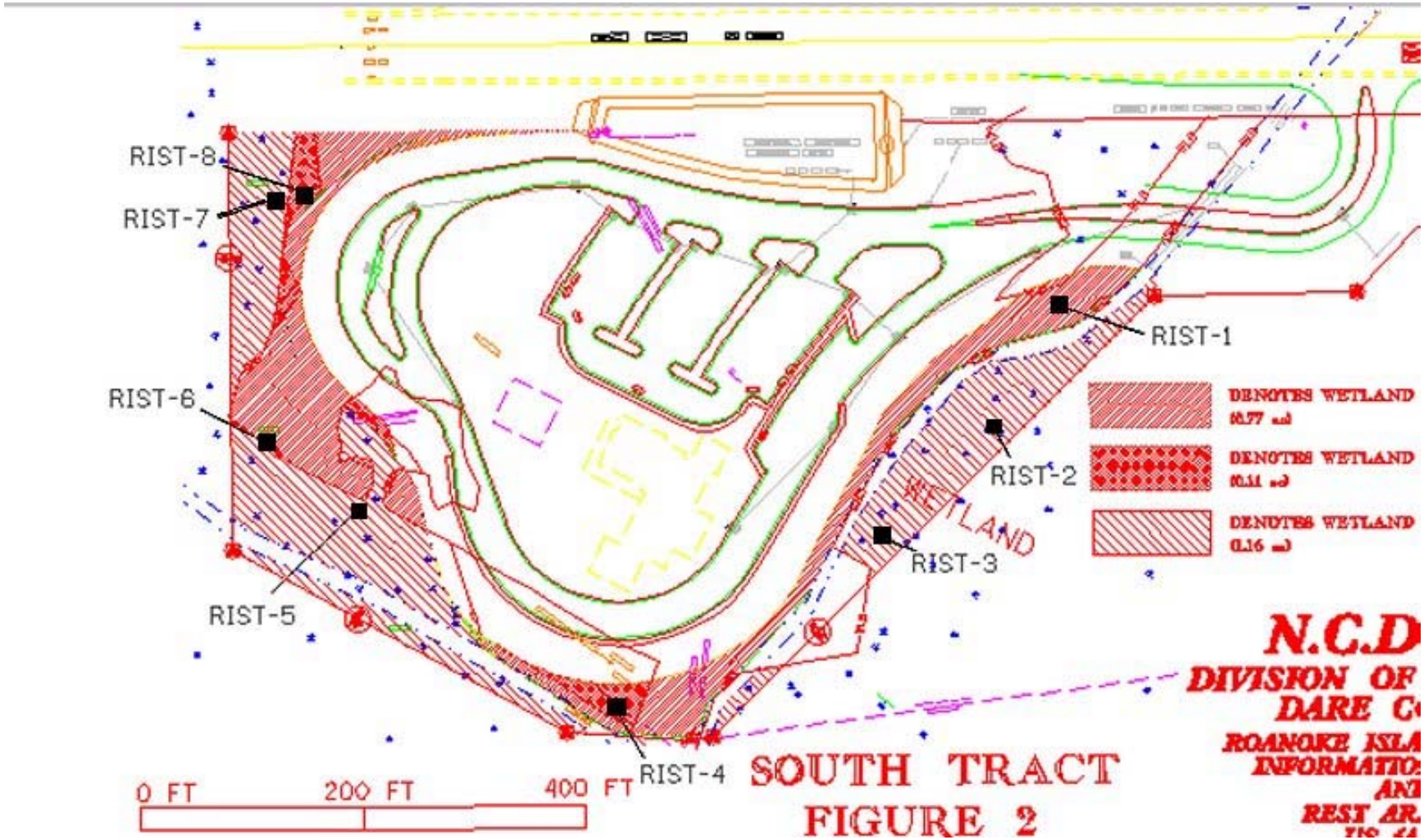

Figure 3. Monitoring Gauge Location Map- South Tract

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

Table 1 is a summary of the hydrologic monitoring results for both the north and south tracts. All of the gauges indicate that the site is meeting jurisdictional success, i.e., each gauge is showing that the groundwater level is within 12 inches of the surface for at least 12.5% of the growing season. The lowest percentage indicated is 17.44% at gauge RIST-7, within the boundaries of the reference area adjacent to the south tract.

The mitigation plan states that the hydrologic conditions of the constructed areas must be within 20% of those in the reference areas. Both of the gauges in the north tract constructed area are within 20% of the saturation period of the site's reference gauge (RINT-3); however, RINT-2, the gauge that is much closer to the reference, has a much lower saturation period than that of RINT-1, which is at the other end of the north tract. The gauges located within the constructed area of the southern tract indicate much longer saturation periods than their counterparts in the reference wetlands. Of the four sets of gauges, the only comparable saturation periods (within 20% of each other) are indicated with gauges RIST-3, 4, 5, and 6. Reference gauges RIST-2 and 7 indicate much lower saturation periods than their closest counterpart in the constructed areas. However, as stated previously, all gauges do indicate jurisdictional success.

Table 1. 2002 Hydrologic Monitoring Results (March 13 – November 25)

Monitoring Gauge	< 5% (<13 dy)	5 - 8% (13-20 dy)	8 – 12.5% (21-32 dy)	> 12.5% (>32 dy)	Actual Consecutive %	Dates Meeting Success
RINT-1				✓	53.49	7/11-11/25
RINT-2				✓	36.05	8/25-11/25
RINT-3 (ref)				✓	53.49	7/11-11/25
RIST-1				✓	81.01	5/1-11/25
RIST-2 (ref)				✓	18.22	10/10-11/25
RIST-3 (ref)				✓	54.26	7/9-11/25
RIST-4				✓	65.89	6/9-11/25
RIST-5 (ref)				✓	65.50	6/10-11/25
RIST-6				✓	53.88	7/10-11/25
RIST-7 (ref)				✓	17.44	10/12-11/25
RIST-8				✓	65.50	6/10-11/25

Notes: "RINT" denotes gauges on the northern tract.
"RIST" denotes gauges on the southern tract.
"ref" denotes gauges in preservation areas of the site, used as reference wetlands.

Figures 4 and 5 are representations of the hydrologic monitoring results. Each gauge is highlighted in blue, as each indicated saturation for more than 12.5% of the growing season.

Appendix A contains a plot of the groundwater depth for each monitoring gauge. While success of the site is based on reference wetlands and not the percentage of the

growing season that the groundwater is within 12 inches of the surface, the –12 inch line is provided as a comparison. The number of days the water level was above this line is also provided on each graph. Precipitation events, as recorded by the onsite rain gauge, are included on each graph as bars. A comparison of the rainfall data collected onsite with that recorded at the Manteo Airport gauge revealed that the onsite gauge collected accurate data.

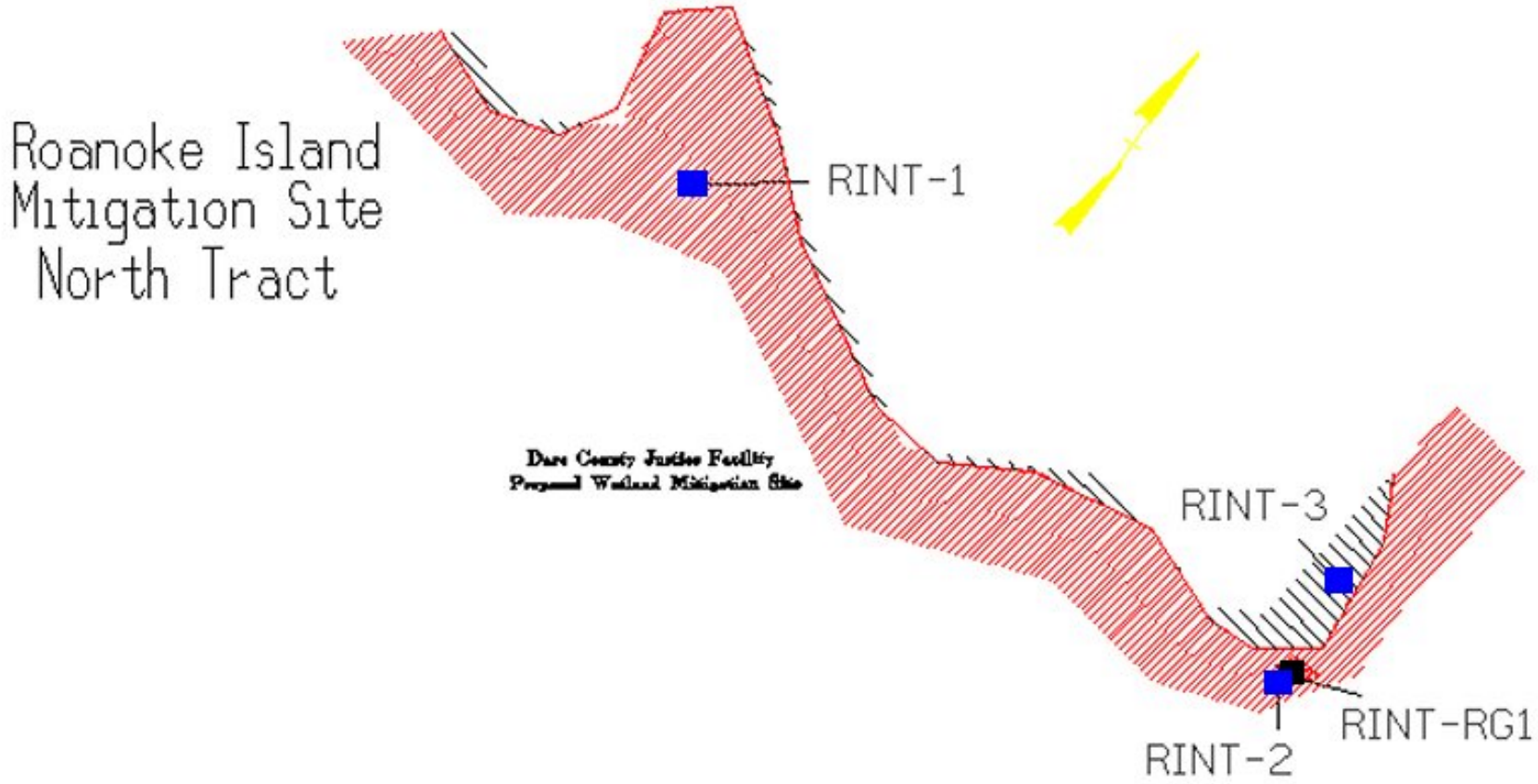

Figure 4. 2002 Hydrologic Monitoring Results- North Tract

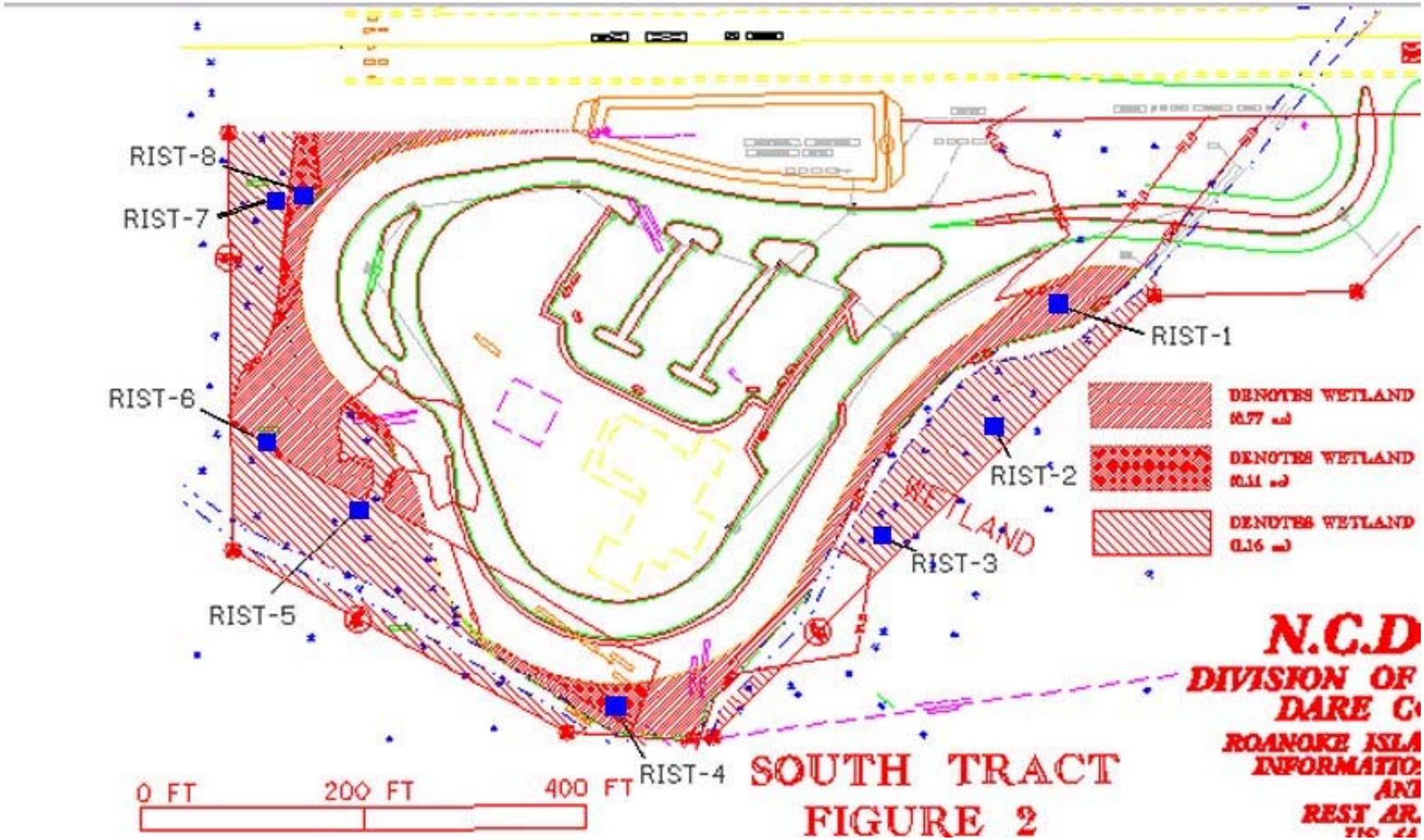

Figure 5. 2002 Hydrologic Monitoring Results- South Tract

2.3.2 Climatic Data

Figure 6 represents an examination of the local climate in comparison with historical data in order to determine whether 2002 was “average” in terms of climate conditions. The figure compares the rainfall from 2002 with that of historical rainfall (data collected between 1971 and 2002). All rainfall data was collected from the NC State Climate Office. The graph shows 2001 rainfall totals recorded at the Manteo Airport from November through December; the graphs also shows 2002 rainfall totals recorded at the Manteo Airport through July. Information from the Manteo Airport for the months of August through December was not available at the time of this report. Thus this plot has been augmented with monthly rainfall totals collected from the onsite rain gauge. Each rainfall data source has been indicated on the figure.

According to the Manteo gauge, the region only received above average rainfall in March and July 2002 (though the July total is virtually equivalent to the 70 percentile total for that month), and average rainfall amounts in January. The August-November data collected at the site indicated that rainfall in late summer and fall was at least average, if not higher, on the site. However, it should be noted that the critical rainy season in winter 2001-2002 was much drier than normal. The Manteo rainfall data from August- November 2002 will be included in the 2003 annual report.

2.4 Conclusions

The Roanoke Island mitigation site is in its first year of hydrologic monitoring. All of the gauges on both tracts indicate that the site is at least meeting jurisdictional success, as all gauges have indicated saturation for at least 12.5% of the growing season. The lowest saturation percentages were actually indicated in the preservation sections that are used as reference areas.

Both gauges in the constructed area on the north tract are within 20% of the saturation period of the reference gauge on that site. On the south tract, half of the gauges are within the saturation period of the reference gauges, while the other half indicate much higher saturation periods than those of their reference counterparts.

NCDOT recommends that the hydrologic monitoring of the site continue.

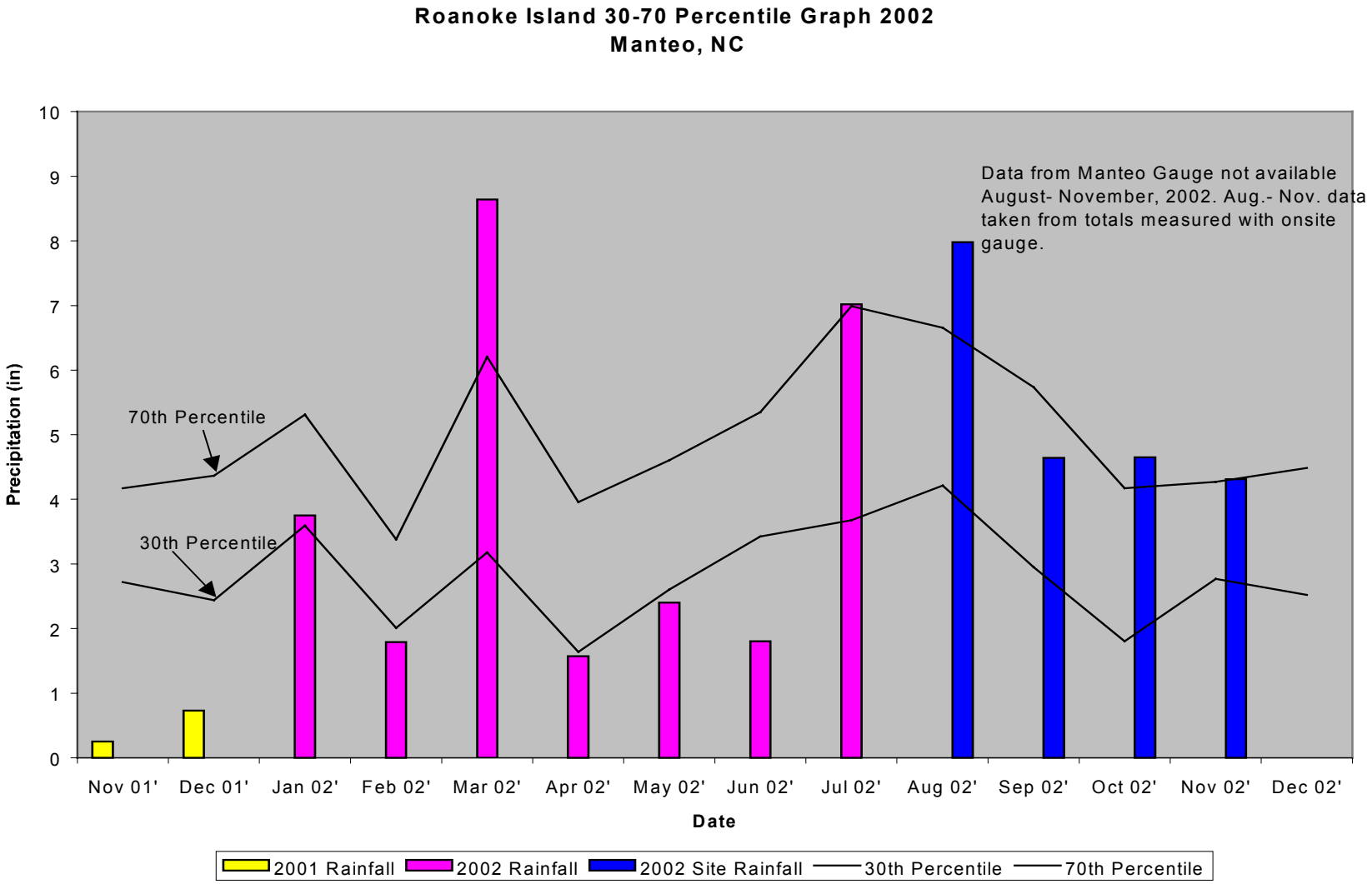

Figure 6. 30-70 Percentile Graph: Manteo, NC

3.0 VEGETATION

3.1 Success Criteria

Success Criteria states that there must be a minimum of 320 stems per acre living for at least three consecutive years. A minimum of 290 trees per acre living at year 4 and a minimum of 260 trees per acre living at year 5.

3.2 Description of Species

The following tree species were planted in the Wetland Enhancement Area:

Taxodium distichum, Baldcypress

Myrica cerifera, Wax Myrtle

Persea palustris, Swamp Redbay

Nyssa sylvatica var. *biflora*, Swamp Blackgum

Gordonia lasianthus, Loblolly Bay

3.3 Results of Vegetation Monitoring

Plot #	Baldcypress	Wax Myrtle	Swamp Redbay	Swamp Blackgum	Loblolly Bay	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1	27	6	4	2		39	39	680
2	3	3	3	4		13	40	221
3	9	9	2	2		22	42	356
4	11	8	2			21	40	357
	Average Tree Density							**404**

Table 2. Vegetation Monitoring Results

Site Notes: Other species noted: dog fennel, thistle, and *Baccharis halimifolia*.
Site was extremely dry with bare ground but evidence of previous standing water was on site.

3.4 Conclusions

Approximately 1.8 acres of this site was planted in the wetland restoration and creation areas in March 2002. The 2002 vegetation monitoring revealed an average density of 404 trees per acre, which is above the 320 trees per acre minimum requirement. NCDOT will continue vegetation monitoring at the Roanoke Visitor Center Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The Roanoke Island Mitigation Site, in the first year of monitoring following construction, has shown initial hydrologic and vegetation success. The hydrologic data indicates that the site is, at minimum, meeting jurisdictional success by showing saturation within 12 inches of the surface for at least 12.5% of the growing season. However, only half of the gauges in the constructed areas on the south tract are within 20% of the saturation period of their respective reference gauge. In two cases, the saturation period was much longer in the constructed zone than in the reference area. Both of the gauges on the north tract are within 20% of the saturation period of the reference gauge on that site.

Vegetation monitoring yielded an average tree density of 404 trees per acre over the four plots. This is well above the 320 stems per acre required in the first three years of monitoring.

Based on the initial promising results, NCDOT recommends that both hydrologic and vegetation monitoring continue in 2003.

APPENDIX A

DEPTH TO GROUNDWATER GRAPHS

APPENDIX B

PHOTO AND VEGETATION PLOT LOCATIONS, SITE PHOTOS

ROANOKE ISLAND VISITOR CENTER

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2002

ROANOKE ISLAND VISITOR CENTER

Photo 7

ROANOKE ISLAND VISITOR CENTER

PHOTO AND VEGETATION PLOT LOCATIONS